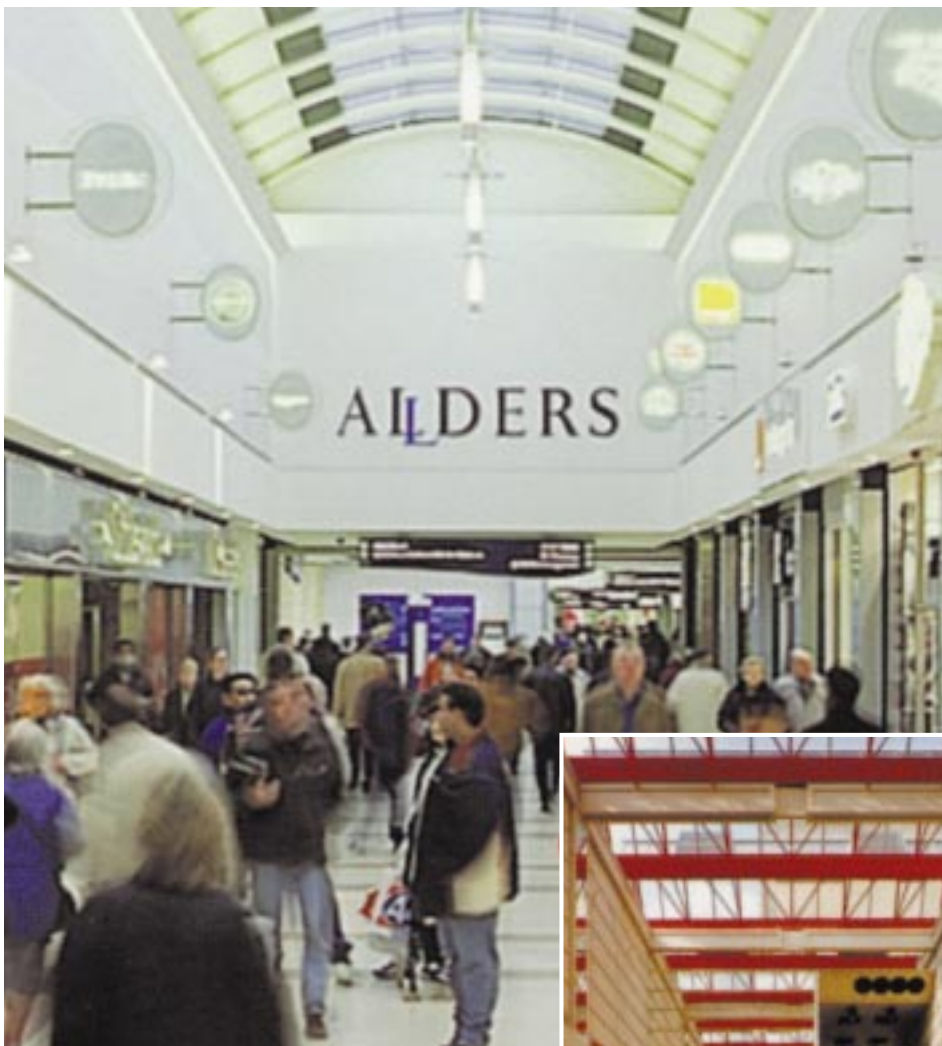


Queensmere Shopping Centre, Slough – refurbishment of a 1970s shopping centre



- 46% reduction in fuel costs and 60% reduction in maintenance and staffing costs
- 53% reduction in carbon emissions
- Improved environment has attracted new, high-quality tenants
- 50% increase in footfall



ENERGY EFFICIENCY

**BEST PRACTICE
PROGRAMME**

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OVERVIEW

Queensmere Shopping Centre was opened in 1973. By the 1990s it looked very dated and did not provide retailers or shoppers with the environment and facilities they required.

Hammerson UK Properties plc (Hammerson) purchased the Centre in 1994 and the adjoining car park in 1996. They decided to undertake an extensive refurbishment. The aims of the refurbishment were:

- to improve the facilities and environment to attract new tenants
- to improve perceptions of Slough and Queensmere Shopping Centre
- to improve the energy and environmental performance of the building and to increase its value.

The refurbishment involved improving:

- the appearance and retail offer of the outside of the Centre, the Town Square and High Street
- the internal appearance of the Centre and its retail spaces and customer facilities
- the car park facilities and security

- the environmental performance of the building by removing central heating and air-conditioning and installing natural ventilation and low-energy lighting.

Trading continued throughout the refurbishment.

Hammerson considers that all their objectives have been met and the refurbishment has resulted in:

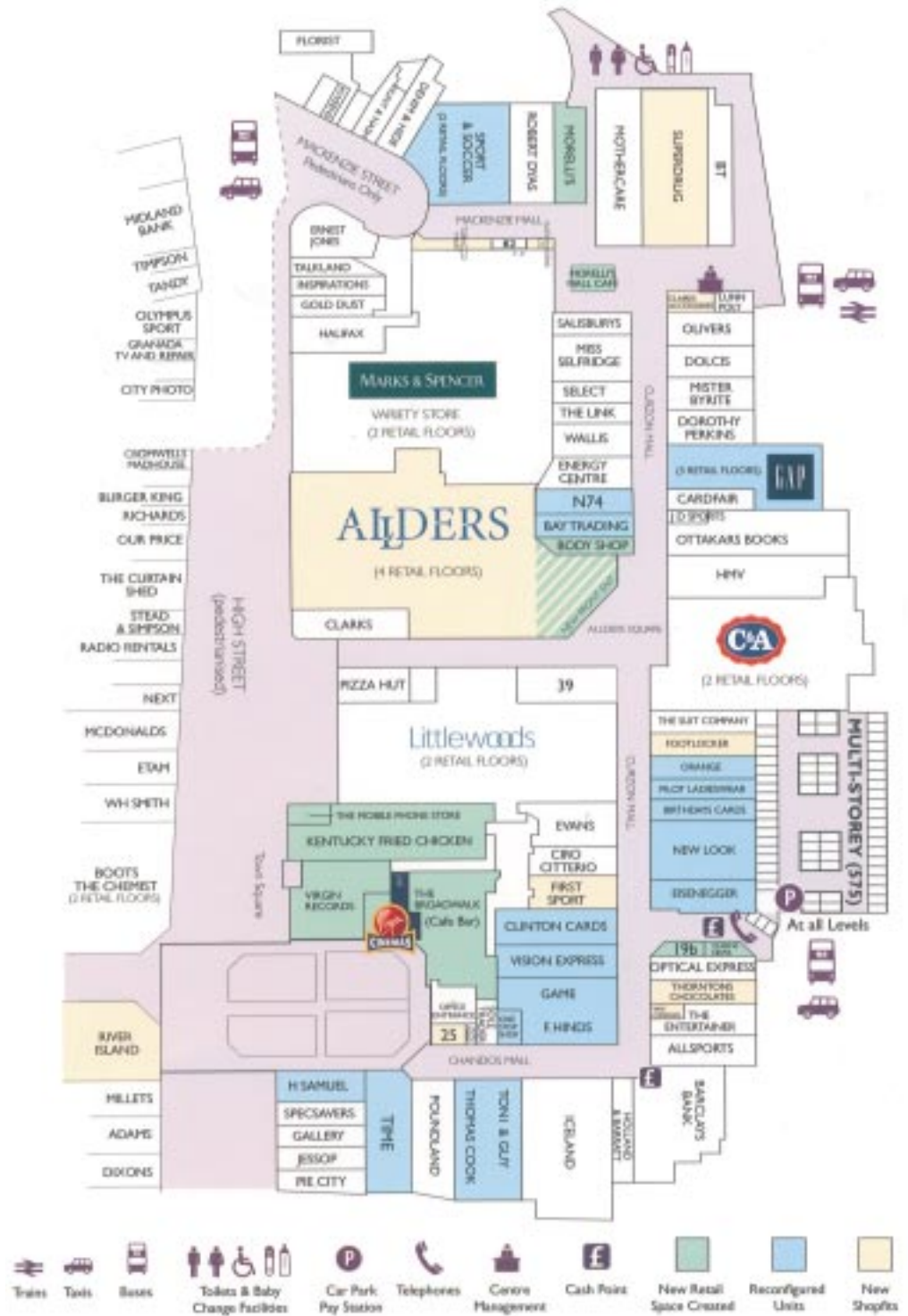
- a 50% increase in pedestrian flow and car park usage
- new tenants moving into the Centre including high-quality retailers such as Gap, evidencing improved perceptions of Slough
- improvements in the trading performance of tenants
- a 46% reduction in energy costs plus reductions in maintenance and staffing costs of 60%
- returns that have exceeded projections with the value of the Centre increasing by over 80% between purchase in May 1994 and May 1999.

The Centre owners, management and tenants are delighted with the refurbished Centre.



Figure 1 Construction of new domed roof during refurbishment

PLAN VIEW OF THE BUILDING



BUILDING DESCRIPTION

SITE

Queensmere Shopping Centre is situated in the centre of Slough between the High Street (a pedestrianised area incorporating the Town Square) and the inner ring road. The main entrance to the Centre is from the Town Square. The ring road gives access to a 570-space car park adjoining the Centre. There is access via a subway to a second multi-storey car park.

FORM AND FABRIC

The Centre was originally opened in 1973. It was built around Slough's existing street plan and constructed from reinforced concrete slabs. Most of the Centre was concentrated at first-floor level

and there were undercrofts and covered walkways at street level. Shops inside the Centre were situated around four malls and a central square.

The Centre, together with the adjoining High Street, has about 100 lettable retail spaces. Tenants include Alders department store and Marks & Spencer along with many high street names and independent retailers. There are also banks, eating places and a cinema and retail complex run by Virgin.

The multi-storey car park next to the Centre was built at the same time as Queensmere Shopping Centre.

THE BRIEF



Figure 2 Approach to Allders Square in May 1997

By the 1990s Queensmere Shopping Centre was in need of refurbishment. It looked very dated and did not provide the type of accommodation or quality of environment required by today's retailers. It was also expensive to operate. The Centre had full heating and air-conditioning in the malls and the lighting was not energy efficient.

Following the purchase of the Centre, Hammerson undertook customer and retailer research to establish a strategy to maximise the Centre's potential. As a result of this research it set a number of objectives for the refurbishment, including:

- improving the physical shopping and car park environment
- attracting new retailers, improving the tenant mix and catering offer
- enhancing the entrances
- improving perceptions of Slough and enabling it to compete with other local centres and towns
- increasing the value of the Centre.

Hammerson is committed to energy efficiency and environmental good practice. The improvement of the energy efficiency and environmental performance of the Centre was a key objective of the refurbishment.

THE DESIGN APPROACH

EPR Architects Ltd was commissioned to produce the design for the refurbishment. Their design addressed the refurbishment objectives in the following ways.

Externally by:

- providing a new Town Square suitable for holding events
- enhancing the main entrance
- replacing and over-cladding original materials with high-quality finishes
- creating new retail units and providing catering units with outside seating.

Internally by:

- creating a new internal square with a glass domed roof
- reglazing the roof
- introducing new and reconfigured retail space
- installing new public services and improving the toilets
- improving the car park and its security.

The Hilson Moran Partnership (Hilson Moran), the M&E engineers, were given the task of improving the energy efficiency and environmental performance of Queensmere.

Their design solution proposed:

- removing heating and air-conditioning
- increasing the amount of daylight in the Centre
- installing new, energy-efficient lighting
- incorporating natural ventilation.

The Shopping Centre was to remain open and trading throughout the refurbishment.

'Hammerson is committed to implementing environmental good practice as far as possible in its shopping centres.'

'At Queensmere Shopping Centre, as part of the refurbishment, we chose a design that would significantly reduce energy consumption. We are delighted with the success of this approach.'

Hammerson UK Properties plc

REFURBISHMENT

After giving full consideration to the appearance of the Centre within the townscape, it was decided to create a light modern look using glass, aluminium and white painted steel.

OUTSIDE THE CENTRE

Town Square is bordered on three sides by the Centre. Considerable work was carried out in Town Square to create an attractive space integrated with the Centre and providing a vibrant heart to Slough.

- Concrete panels were overlaid with opaque glass.
- A glazed canopy was created around three sides of the Square, and the Centre entrance was emphasised with a large canopy featuring the new Queensmere logo.
- The undercroft areas were converted to retail and café units.
- New paving contrasting with the High Street paving was laid to give the sense of a distinct space.
- New outside light fittings and floodlighting were installed.
- A public sculpture made by the local community – a stainless steel tree with birds – was commissioned and installed in Town Square.



Figure 3 Refurbished Town Square and public sculpture

INSIDE THE CENTRE

Malls

The appearance of the four malls was greatly improved by the refurbishment. Before refurbishment nine substations – eight housing transformers and all having plant rooms above them – were suspended from the ceiling of Curzon Mall. Five of these substations and all the plant rooms were removed during refurbishment and a new glazed roof was installed. This greatly increased daylight penetration. The ceilings of the three other malls were also refurbished.

Further improvements were made to the malls by:

- adding new customer facilities including toilets, baby care facilities, cash machines and store directories
- the design and installation of new corporate signage
- installing glass-fronted pilasters and a fascia band that can be used for tenant logos
- installing illuminated shop signs
- installing new lighting which has improved light levels.

Four new retail units were created and 15 retail units were reconfigured to meet retailer requirements.

Alders Square

Alders Square, at the heart of the Centre, was completely refurbished to create an area for events.

- The roof lights were replaced with a central dome of glass and steel.
- New pendant lighting was installed.
- The floor was levelled.

Car park

Work undertaken in the car park included:

- increasing lighting levels
- upgrading lobbies and automatic doors
- adding disabled, and parent and child spaces, together with help points
- improving security
- installing new signs.

REFURBISHMENT

ENERGY EFFICIENCY FEATURES

Ventilation

The air-handling and chiller plant was removed (see the box on the right). It was replaced by a natural ventilation system and 41 extractor fans situated in the roof.

The natural ventilation system utilises the stack effect which is facilitated by the new arching roof structure. Roof lights automatically open when the mall reaches 19°C, drawing fresh air through the malls.

The extract fans have variable speed drives and are automatically activated when temperatures in the malls reach a pre-set temperature. Currently this temperature is set at 23°C.



Figure 4 Allders Square showing new domed roof and pendant lighting

THE REFURBISHMENT PROCESS

Trading continued throughout the refurbishment of Queensmere Shopping Centre. This required careful planning and meant that the works lasted longer than they would have done if the Centre had been closed. It also required many tasks to be undertaken while the Centre was closed at night.

Refurbishment work began in June 1997 and was completed in February 1999, with two four-month breaks from October to February so that disruption was kept to a minimum during the busy Christmas period.

Before the work began the heating and cooling systems were switched off to assess the effect of removing the plant.

Refurbishment involved removing plant rooms in the roof of the Centre. These contained chillers and air-handling units. The contractor installed a temporary roof to enable this work to be undertaken with minimum disruption and without risk to shoppers. Openings were made in the temporary roof for the smoke extractors and the smoke extraction system was maintained throughout the refurbishment.

Hilson Moran's design strategy included an option to add mechanical cooling if the natural ventilation supplemented by the fans was not sufficient. It has not been necessary to utilise this option.

Heating

The Centre was originally fully heated using a central gas boiler plant. It also had 16 over-door heaters at the entrances. During refurbishment, the boilers and the heating system were removed. New electric over-door heaters were installed and are now the only heating in the Centre.

REFURBISHMENT

Hot water

Domestic hot water for the toilets is provided by local electric heaters.

Lighting

Prior to refurbishment, nine substations were suspended from the roof. These restricted daylight penetration. Electric lighting was provided by a combination of T12 fluorescent lamps and metal halide lamps. This lighting system did not provide satisfactory light levels and was not energy efficient. Removal of five of the nine substations greatly increased levels of daylight.

New glazed roofs were installed in Curzon Mall and Allders Square. The old lighting system was removed and a new system with feature

pendant lighting and spotlighting was installed. This system gives greatly improved levels of illumination and utilises energy-efficient, compact fluorescent lamps and high-frequency ballasts.

Controls

With the removal of the boilers, chillers, and heating systems there is no need for a building energy management system. However, there is a central control system for fan and rooflight operation. The natural ventilation system is automatically activated when mall temperatures reach 19°C and extractor fans in the roof switch on at 23°C. Lighting is switched on and off manually. The over-door heaters are fitted with thermostats.



Figure 5 Curzon Mall during refurbishment

RESULTS

SAVINGS

The refurbishment work has cut the cost and reduced the environmental impact of running Queensmere Shopping Centre.

- Yearly energy costs have been cut from £98 017 to £53 326, saving £44 691. This is a saving of 46%.
- The amount of energy used has been reduced by 65% – 2 380 844 kWh a year.
- Carbon emissions have been reduced by 53% with a reduction of 186 tonnes of carbon a year.
- Maintenance costs have also been reduced because there is no longer a need to maintain boiler and chiller plant. Maintenance staff have been reduced from five to two – a saving of £53 000 a year.

ENERGY SPLIT

Changes that affect energy consumption include:

- lighting
- heating and cooling
- increased fabric insulation and low-emissivity glass.

Figure 6 shows the estimated split of energy consumption in the Centre. (The 'other' category includes domestic hot water, small power, automatic doors and security equipment.)

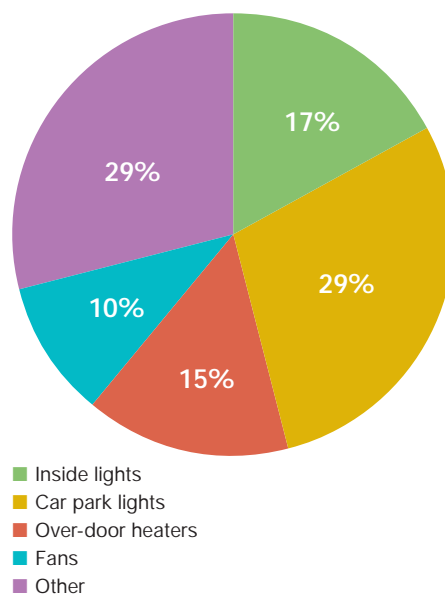


Figure 6 Breakdown of energy use

Figure 7 shows energy consumption before and after the refurbishment. It does not include savings on maintenance.

TEMPERATURES

Hammerson wanted the temperatures in the malls to be similar to those outside so that a shopper walking in from the street should not notice a significantly different temperature in the mall.

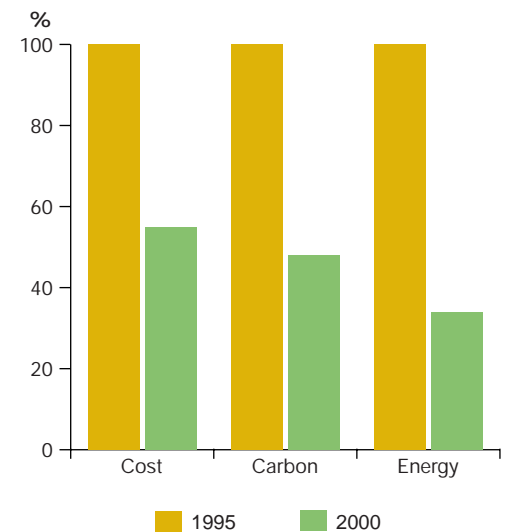


Figure 7 Effect of refurbishment on energy consumption

'Energy consumption has been reduced by 65%, giving yearly savings of £45 000.'

Maintenance costs, including staffing costs, have been reduced by 60%, saving over £50 000 a year.

Carbon emissions have been reduced by 186 tonnes a year, a reduction of 53%.'

RESULTS

The M&E engineers modelled the environmental performance of the building and estimated that the Centre would only reach a temperature higher than 26°C during occupation for eight days a year. They also estimated that the temperatures would not fall below 13°C during occupied hours. Temperatures in the Centre were monitored for six months, from January to July 2000.

The temperatures in the Centre during the winter period were an average of 7.6°C warmer than the outside temperatures. The average temperature inside the Centre was 14.3°C.

Figure 8 shows the average mall temperature compared to the outside temperature during the first week in February.

During the summer, temperatures were closer to external temperatures, with it being up to 3°C warmer in the Centre.

Figure 9 shows the temperatures during the last week in July. During opening hours the temperature in the Centre was between 15°C and 25°C for 75% of the time. The temperatures remained within the target band of 13°C to 26°C for nearly 90% of the time.

Figure 10 shows the proportion of occupied hours for which the temperature was within certain bands.

OCCUPANT ATTITUDES

During the monitoring period, managers of shops were surveyed about their attitudes to the building.

They were asked about:

- the appearance of the Centre
- temperatures in the malls
- light levels.

Tenants who had moved to the Centre since refurbishment were asked whether it had influenced their decision to move. Forty-three shop managers took part in the survey.

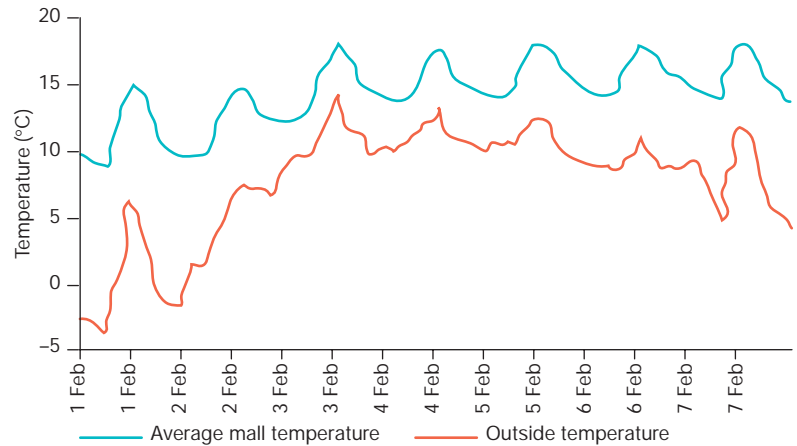


Figure 8 Winter temperature profile

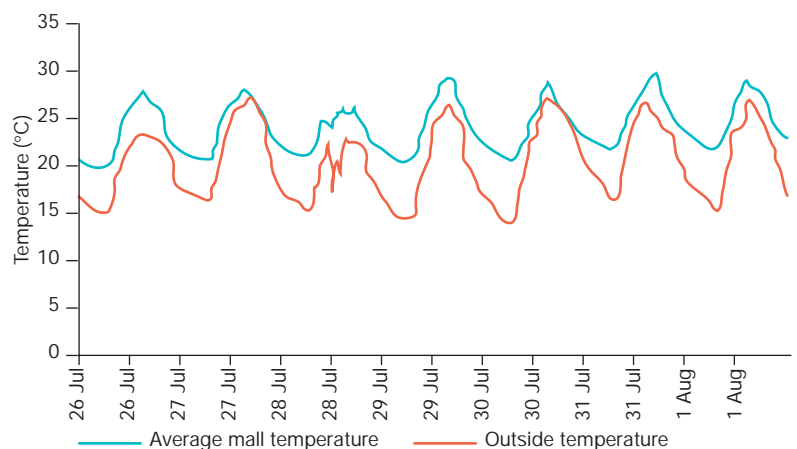


Figure 9 Summer temperature profile

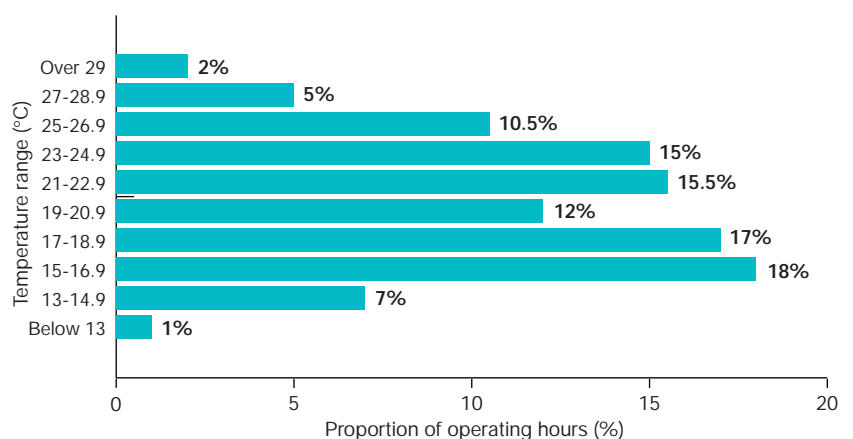


Figure 10 Temperature during operating hours

RESULTS

'It is a much more pleasant environment to work in.'

'The glazed roof is a great success, it makes the Centre brighter and more welcoming for the shopper.'

Tenants' comments

All of the shop managers involved in the survey thought the appearance of the Centre had been improved by the refurbishment. Over 50% praised the new glazed roofs and increased levels of daylight. The new lighting and signage systems, the decor and the improved car park security, lighting and signage were also liked by respondents.

Temperatures in the malls

Fifty-four percent of respondents thought the temperature in the malls in winter was acceptable but 46% thought the malls were too cold.

The Centre management, however, has received no complaints about winter temperatures from shoppers.

Monitoring showed the temperatures in the malls in winter to fluctuate between 12°C and 17°C. Mall temperatures were on average 7.6°C warmer than outside temperatures. These temperatures should not feel cold for shoppers wearing coats but tenants wearing indoor clothing could find them cold. Tenant dissatisfaction with temperatures could be due to expectations. Traditionally malls have been heated and cooled as was Queensmere prior to refurbishment.

Tenant satisfaction with temperatures could be improved if the Centre management regularly informed occupants about the advantages of the unheated malls including the reduction in energy costs which keeps their service charges low.

Eighty-five percent of respondents said that temperatures in summer were acceptable. Fifteen percent said that temperatures were sometimes too hot. Monitoring showed summer temperatures to be slightly warmer inside the Centre than outside.

Following refurbishment a presentation was made to all tenants. Staff turnover in the retail industry is high, so any new staff/occupants since the presentation may not be aware of how the Centre works and of its benefits.

Light levels

Ninety-three percent of respondents were very pleased with light levels in the refurbished Centre. The glazed ceilings, increased daylight levels and new lighting were praised.

New tenants

Eighteen retailers have opened stores in Queensmere Shopping Centre since its refurbishment. They include Gap, Accessorize, Subway and Toni & Guy. Twelve of these new tenants answered questions about the influence of the refurbishment on their decision to open stores.

- All respondents said they would not have moved to the Centre if it had not been refurbished.
- Seven respondents said the increase in shoppers since the refurbishment had influenced their decision to open stores.
- Five respondents said that the increase in High Street names had attracted more shoppers.
- One respondent said their move had been influenced by the new 'upmarket' shopping facilities at the Centre.

OTHER ISSUES

PAYMENT OF CONSULTANTS

M&E engineers are normally paid a percentage of the cost of service installations; a method which could discourage energy-efficient schemes such as that at Queensmere, which have low levels of installed services.

Hilson Moran had an ongoing relationship with Hammerson and knew that Hammerson wanted an energy-efficient design for the Centre. They therefore proposed that their fees for the project be based on the total cost of the works rather than the traditional method of basing fees on the value of the services installation.

The Association of Consulting Engineers publishes schedules of rates for M&E engineers based both on services value and on the total costs of the works. Hilson Moran negotiated a percentage fee with Hammerson based on these published rates. The design costs were similar to those for a conventional solution.

The fee is fixed, so there is a strong incentive to get the design right first time. This was achieved by carrying out an option study at the start of the work to ensure that the design was practical and would meet Hammerson's requirements before the detailed design stage commenced.

The architects, ETP Partnership, were very closely involved in developing the design solution for Queensmere. However, none of the professionals

spent more time on the work than they would have done for a conventional design.

COSTINGS

At the start of the work, Hilson Moran assessed two options for heating and ventilation.

- Option one – replace the worn out boilers and chillers and continue to provide heating and cooling for the malls.
- Option two – a mainly passive solution that had the option of adding mechanical cooling if the resulting conditions were unacceptable.

For either option, the roof would have been improved and Hilson Moran estimated that the cost of removing the plant rooms would be similar to the cost of improving their appearance.

The cost of replacing the plant for option one was estimated at £500 000 compared to the £75 000 cost of installing extract fans in the roof for option two. If additional mechanical cooling had been required for option two this would have cost a further £75 000 to install.

Hammerson was able to make the decision to proceed with option two based on:

- the lower running costs
- the lower capital costs
- the results of environmental modelling, which showed that conditions in the Centre would remain within acceptable bands.

DESIGN LESSONS

The refurbishment of Queensmere Shopping Centre has been successful both commercially and environmentally. Designers should note the following successful strategies.

- Considerable savings were made on capital costs by not replacing heating and air-conditioning plant.
- Big cuts in energy and maintenance costs were achieved by not replacing heating and air-conditioning plant.
- Improvements in the levels of daylight were an extremely successful and popular way of improving the environment of the Centre.
- Low-energy lighting systems increased light levels while contributing to the reduction in energy costs.
- Comfort levels in the malls are acceptable to shoppers despite there being no heating and no air-conditioning.



Figure 11 New glazed canopy over main entrance to the Centre

The method of agreeing a fee for the M&E engineers working on Queensmere provides a useful model. It demonstrates that M&E engineers can be encouraged to produce designs for services minimising the use of plant by agreeing fees based on a percentage of the total cost of works, rather than a percentage of the cost of the plant.

POTENTIAL IMPROVEMENTS

There are few areas that could have been improved.

Automatic lighting controls could further reduce energy consumption. However, the M&E consultants felt that it would have looked strange if lights in one area of the Centre were on while lights in other areas were off. They were also concerned about the visual effect of lights switching on and off during the day. Although they were not used at Queensmere for cosmetic reasons, automatic lighting controls are often successfully used in shopping centres.

Mall temperatures in winter were warmer than outside temperatures but some shop managers found the malls cold. However, there is no evidence that customers are unhappy with the temperatures in the malls in winter. After the refurbishment tenants were given a presentation explaining how the Centre worked and its environmental benefits. This should have helped to manage tenant expectations and improve satisfaction levels. Retailing, however, has a high staff turnover and a number of the current occupants may not be aware of the environmental and cost advantages of the unheated malls. Information on these benefits could be regularly provided to shop managers and this could be disseminated at staff briefings or during induction programmes. This could further increase tenant satisfaction.

FURTHER INFORMATION

**DESIGN ADVICE**

The Design Advice service is a government-sponsored initiative that offers design teams and their clients independent and objective advice on all aspects of energy-efficient and environmental design.

Subject to a simple eligibility criterion, a one-day consultation is available, paid for by a cash-back scheme. It will be undertaken by a consultant registered with the service, who will provide a brief written report detailing design recommendations.

Tel 0800 585794

Website www.bre.co.uk/designadvice

This Case Study was produced by Databuild on behalf of BRECSU for the Government's Energy Efficiency Best Practice programme. BRECSU and Databuild would like to thank the management and staff of Queensmere Shopping Centre for their assistance in this study.

FURTHER READING**BRE**

- BRE Digest 399. Natural ventilation in non-domestic buildings

British Standards Institution

- BS 5925. Code of practice for ventilation principles and designing for natural ventilation

BSRIA

- TN11/95. Control of natural ventilation

**ENERGY EFFICIENCY BEST PRACTICE
PROGRAMME DOCUMENTS**

The following Best Practice programme publications are available from BRECSU Enquiries Bureau. Contact details are given on the back cover.

Good Practice Guides

- 134 Energy efficiency for shopping centres
- 201 Energy efficient refurbishment of retail buildings
- 210 Energy efficient lighting in the retail sector
- 237 Natural ventilation in non-domestic buildings – a guide for designers, developers and owners

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The Government's Energy Efficiency Best Practice programme provides impartial, authoritative information on energy efficiency techniques and technologies in industry and buildings. This information is disseminated through publications, videos and software, together with seminars, workshops and other events. Publications within the Best Practice programme are shown opposite.

Visit the website at www.energy-efficiency.gov.uk
Call the Environment and Energy Helpline on 0800 585794

For further specific information on:

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Energy Consumption Guides: compare energy use in specific processes, operations, plant and building types.

Good Practice: promotes proven energy-efficient techniques through Guides and Case Studies.

New Practice: monitors first commercial applications of new energy efficiency measures.

Future Practice: reports on joint R&D ventures into new energy efficiency measures.

General Information: describes concepts and approaches yet to be fully established as good practice.

Fuel Efficiency Booklets: give detailed information on specific technologies and techniques.

Introduction to Energy Efficiency: helps new energy managers understand the use and costs of heating, lighting, etc.